

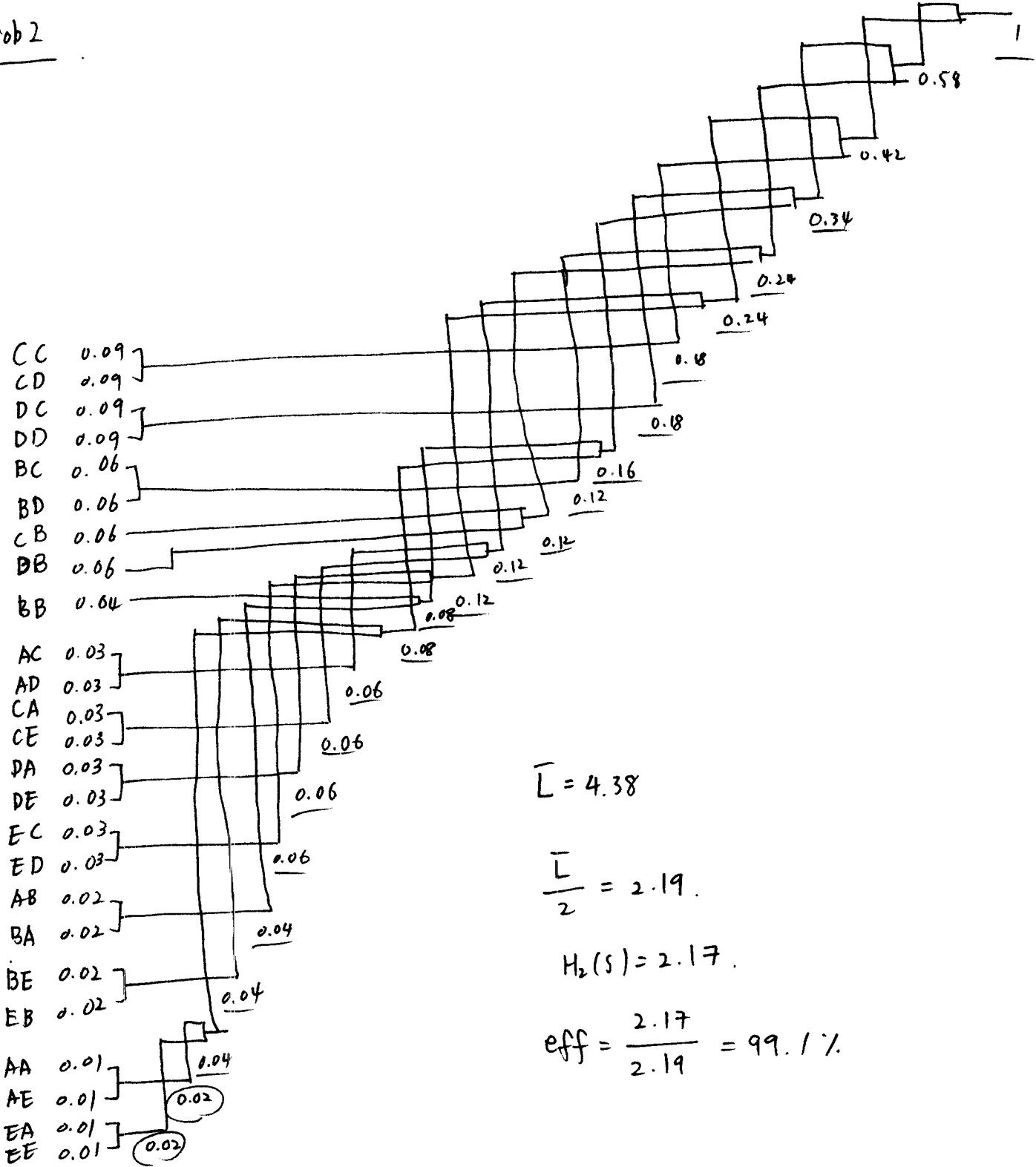
Solutions to ECE 154C Problem Set 2

1. Solution:

$$H_2(X) = \sum_x p(x) \log_2(1/p(x)) \approx 2.17$$
$$H_3(X) = \sum_x p(x) \log_3(1/p(x)) \approx 1.37$$
$$H_4(X) = \sum_x p(x) \log_4(1/p(x)) \approx 1.085$$

Solutions continued on scanned pages.

prob 2



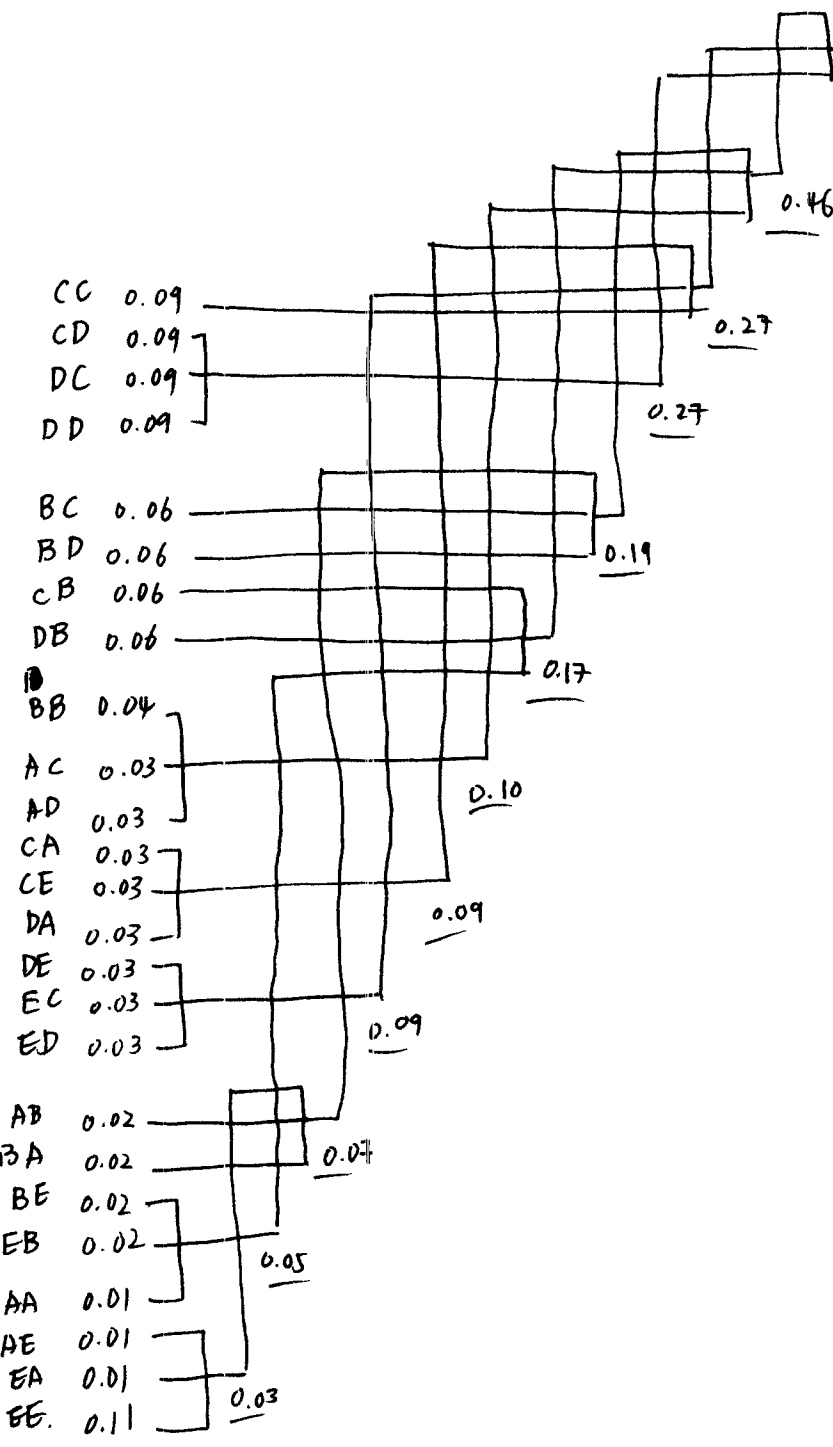
$$\bar{L} = 4.38$$

$$\frac{\bar{L}}{2} = 2.19$$

$$H_2(s) = 2.17$$

$$eff = \frac{2.17}{2.19} = 99.1\%$$

Prob 3

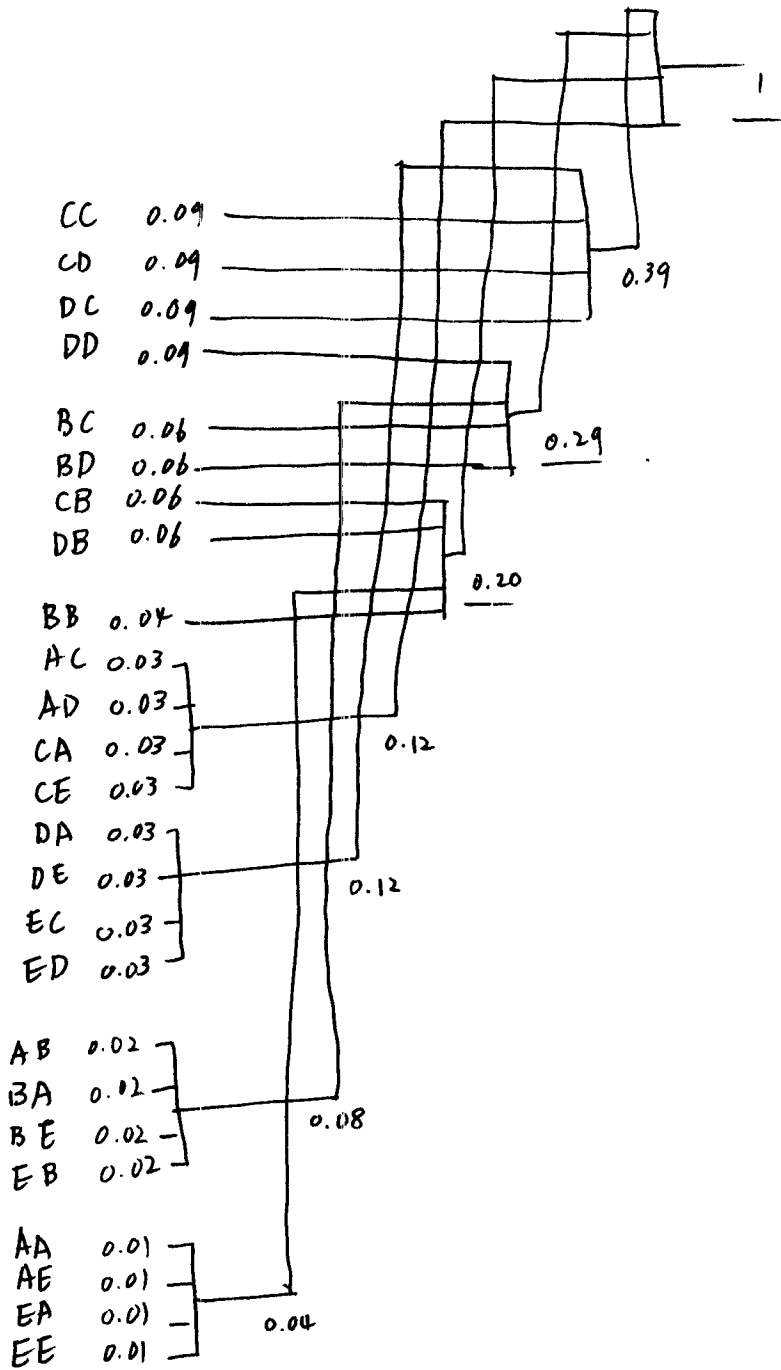


$$\bar{L} = 2.79$$

$$\frac{\bar{L}}{2} = 1.39$$

$$eff = \frac{1.37}{1.39} = 98.2\%$$

prob 4

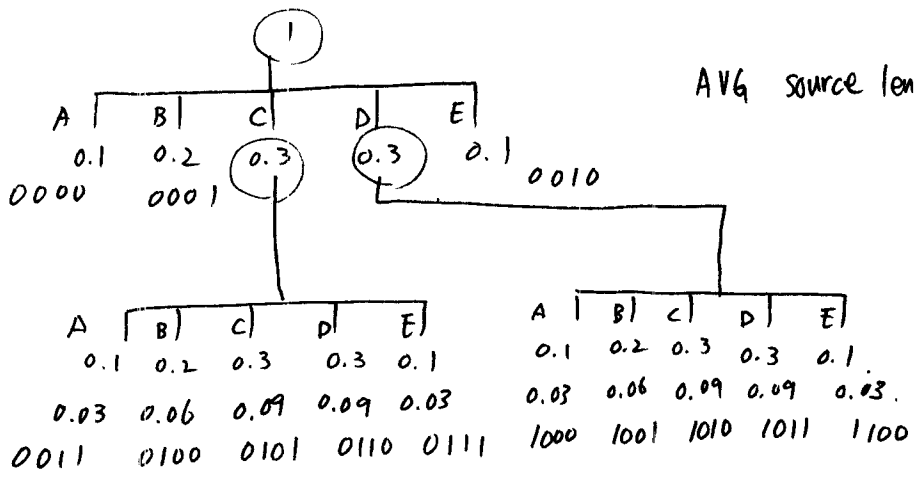


$$L = 2.24$$

$$\frac{L}{2} = 1.12$$

$$eff = \frac{1.09}{1.12} = 97.3\%$$

Prob 5

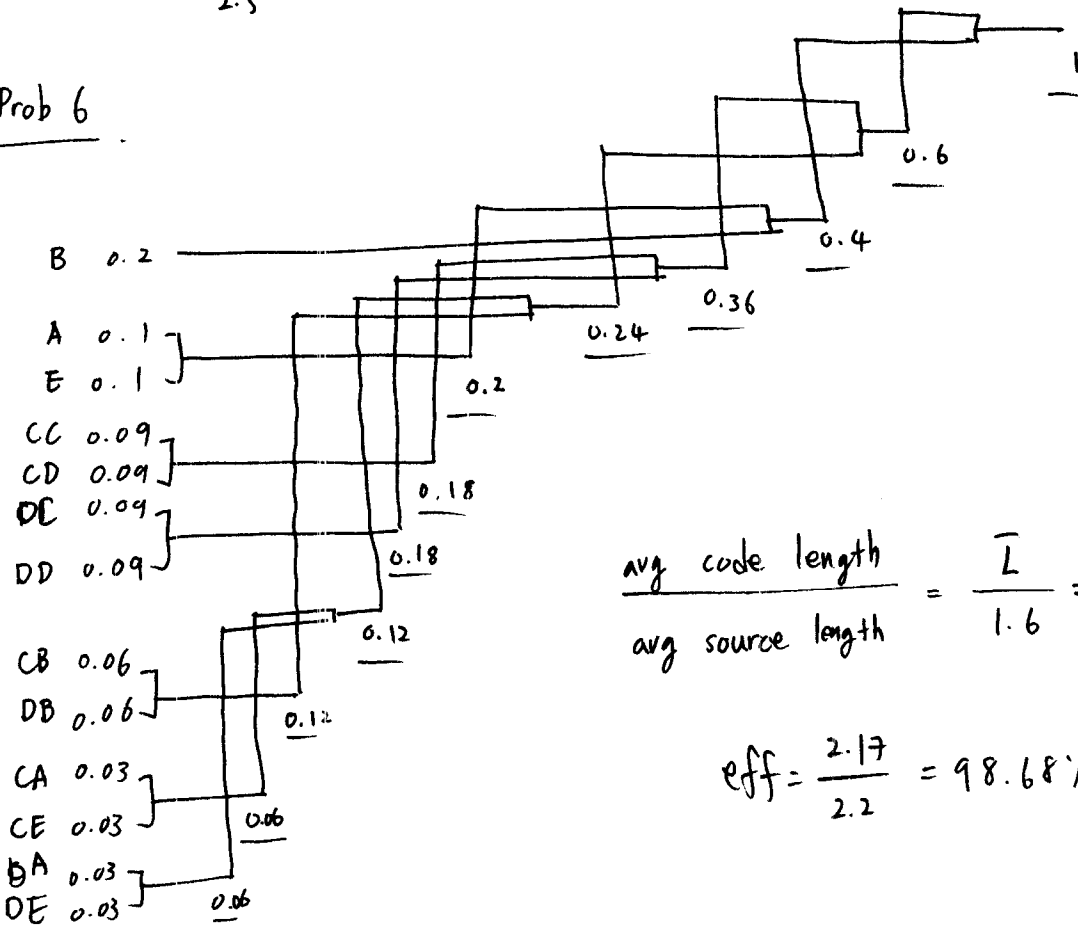


AVG source length = $1 + 0.3 + 0.3 = 1.6$.

$$\frac{\text{AVG code length}}{\text{AVG source length}} = \frac{4}{1.6} = 2.5$$

$$\text{eff} = \frac{2.17}{2.5} = 86.8\%$$

Prob 6



$$\frac{\text{avg code length}}{\text{avg source length}} = \frac{\bar{L}}{1.6} = 2.2$$

$$\text{eff} = \frac{2.17}{2.2} = 98.68\%$$

Prob 7

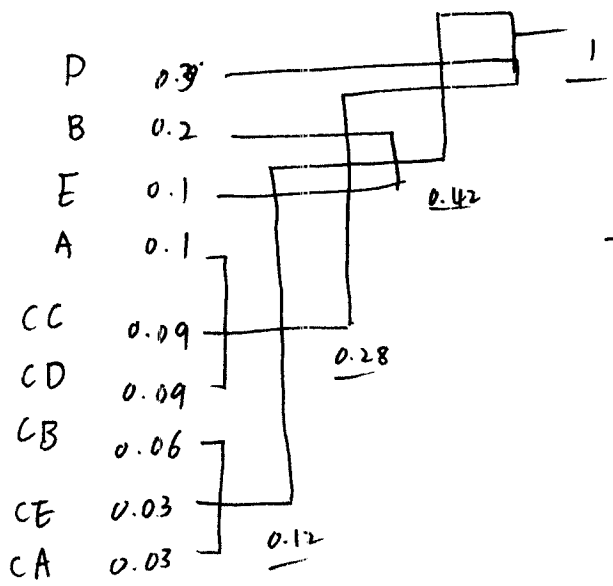
	A	B	C	D	E
00	0.1	0.2	0.3	0.3	0.1
		01		02	10

	A	B	C	D	E
	0.03	0.06	0.09	0.09	0.03
11		12	20	21	22

AVG source length = 1.3

$$\frac{\text{avg code length}}{\text{avg source length}} = \frac{2}{1.3} = 1.538$$

Prob 8



$$\frac{\text{avg code length}}{\text{avg source length}} = \frac{1.82}{1.3} = 1.4$$

$$\text{eff} = \frac{1.37}{1.4} = 97.9\%$$